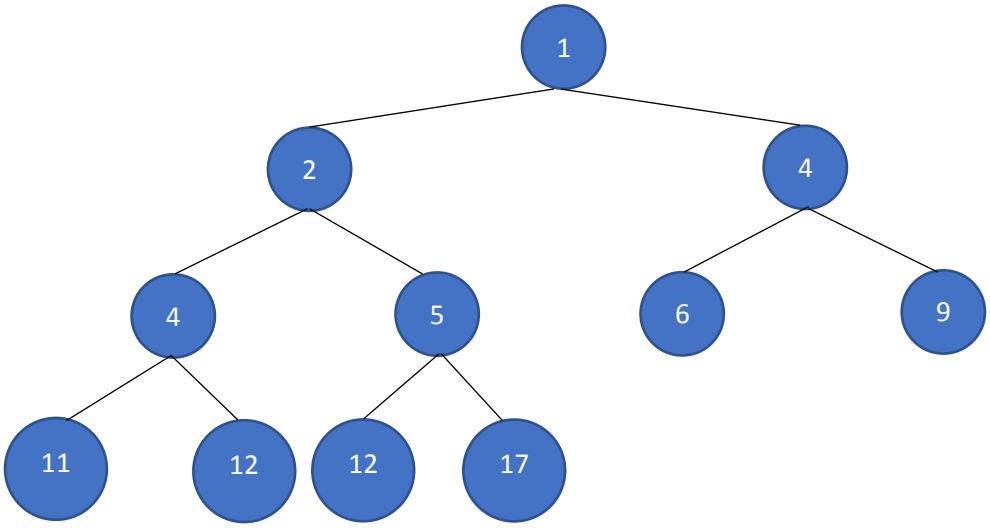
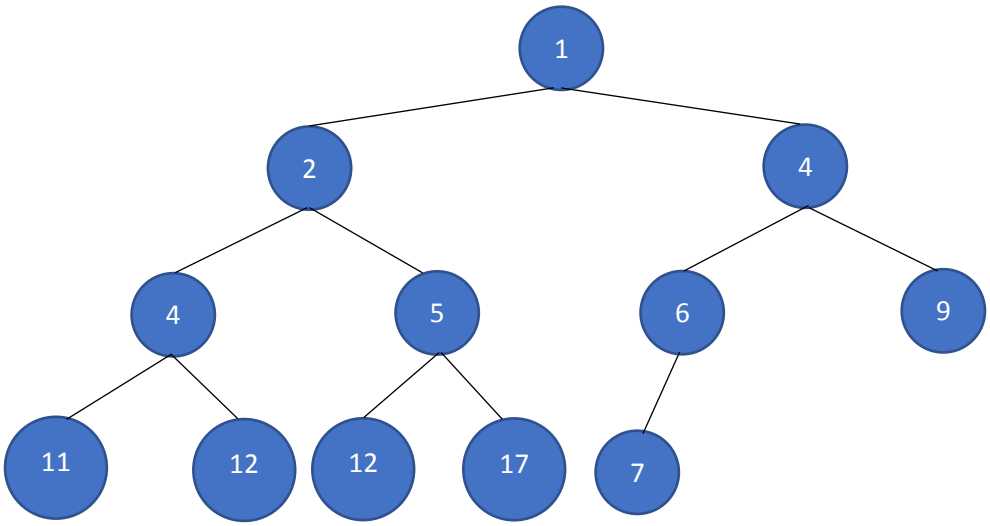
Algorithm: Lab9 (By Sujiv Shrestha ID:610145)
Problem 1.

1. Starting with the values 1, 2, 4, 4, 5, 6, 9, 11, 12, 12, 17, do the following:
    a. Create a MinHeap H in which these values are the keys.
    b. Perform the insertItem algorithm to insert the value 7 into H. Show all steps.
    c. Perform the removeMin algorithm on H and show all steps.

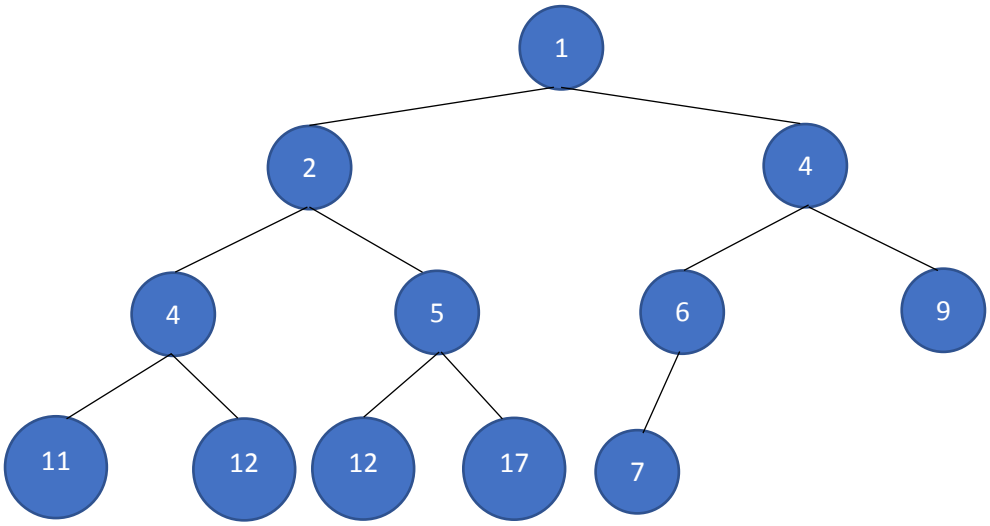
a. MinHeap H



b. insertItem 7
Step1: insert as new node

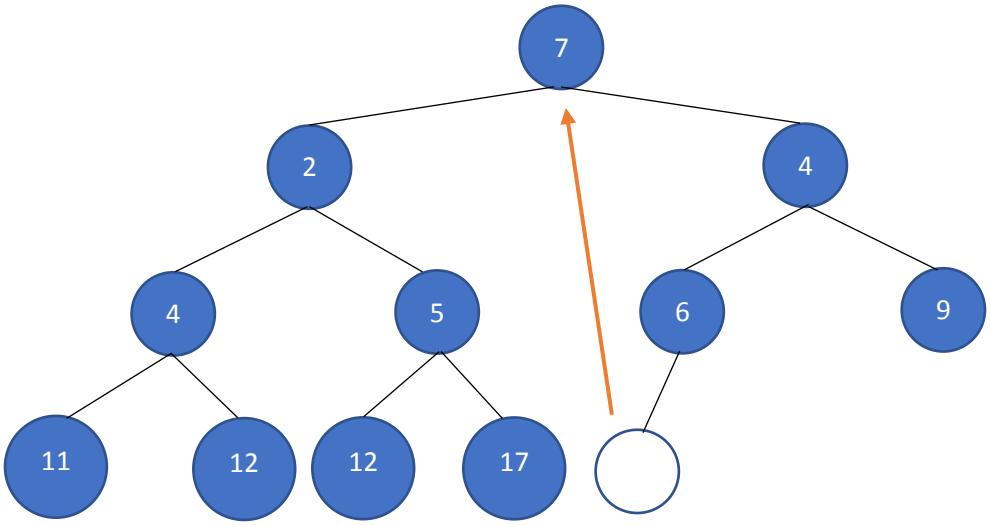


Step2: Restore minheap by swapping with parent node where parent is greater (minheap has no heap-order violation)

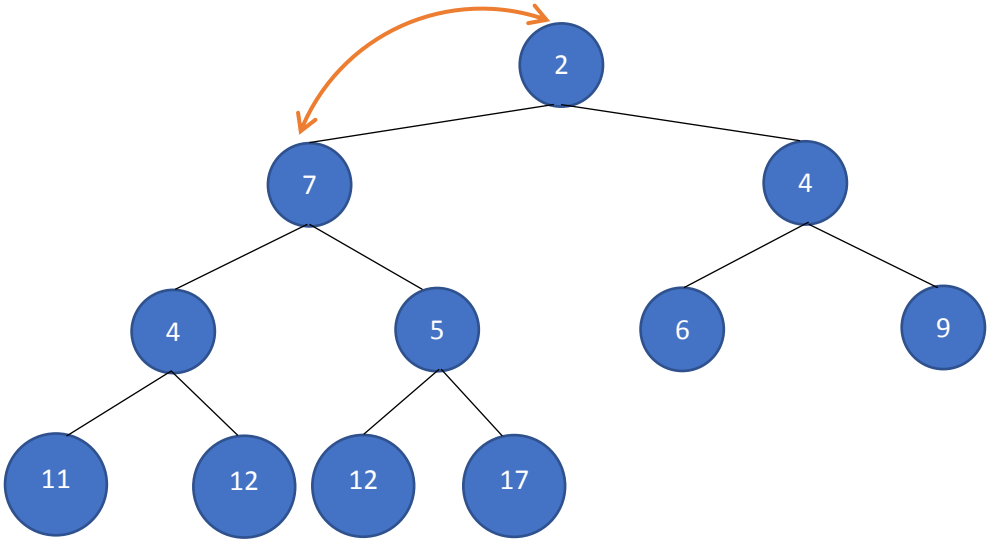


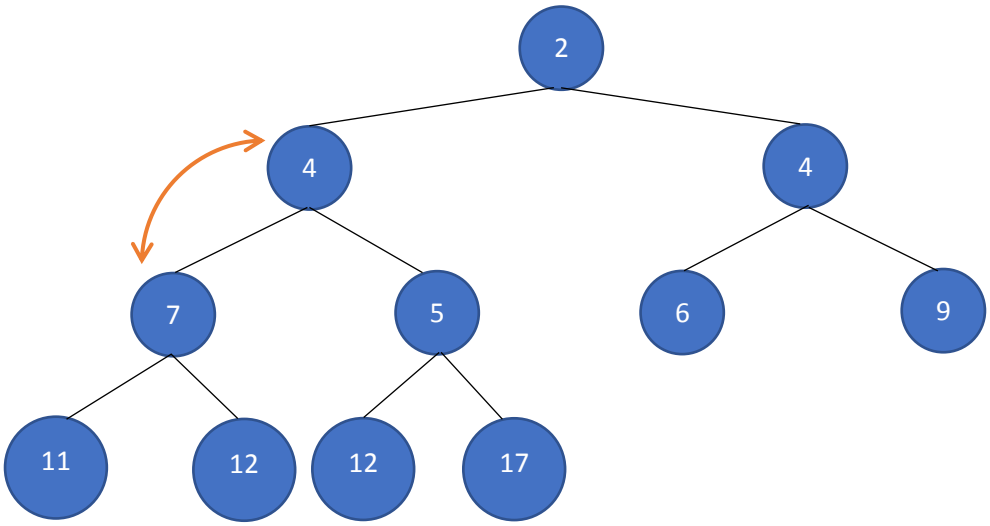
c. Perform remove min

Step1: Replace root node with the last entered node



Step2: Restore minheap eliminating heap-order violation by replacing node with least children till it becomes leaf node or heap-order violation is eliminated.

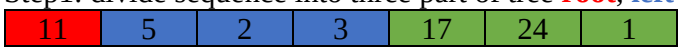




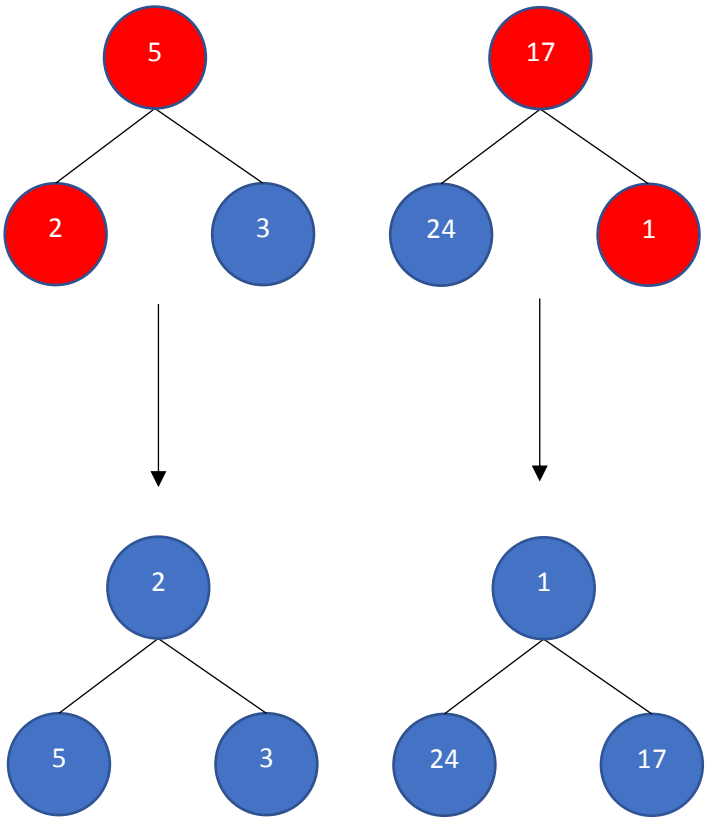
Problem2

2. Carry out the steps of the recursive algorithm BottomUpHeap for the input sequence 11, 5, 2, 3, 17, 24, 1

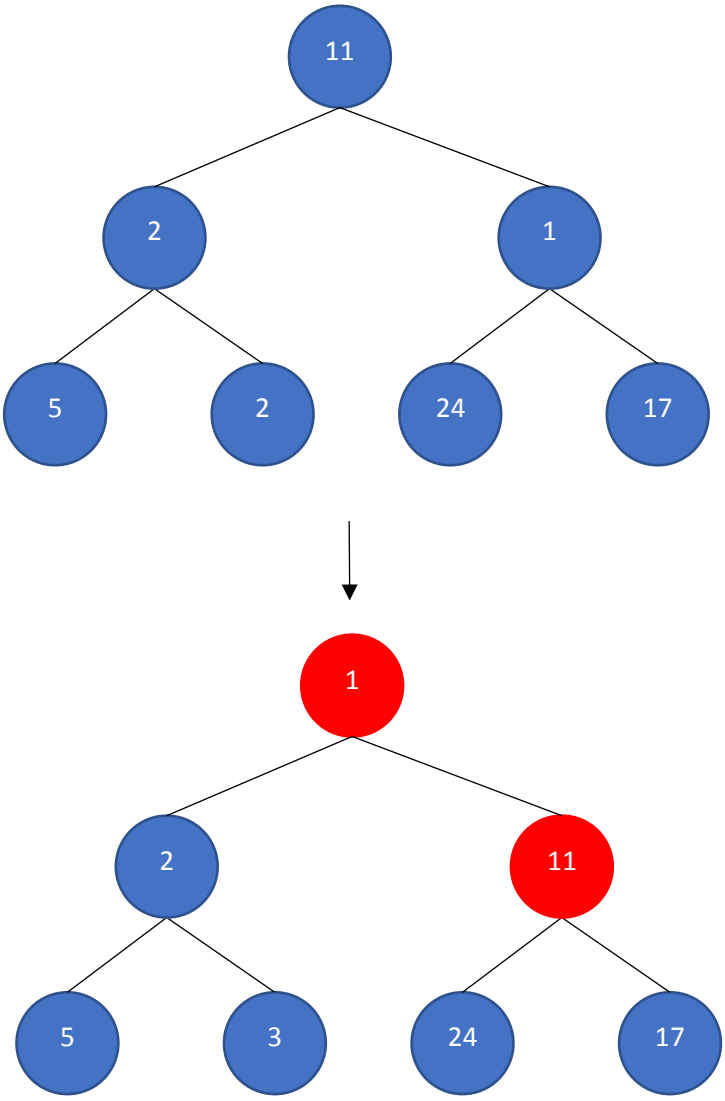
Step1: divide sequence into three part of tree **root**, **left** and **right** recursively.



Step2: sort left, root and right and create a subtree, downheap incase of heap-order violation and return to respective call.



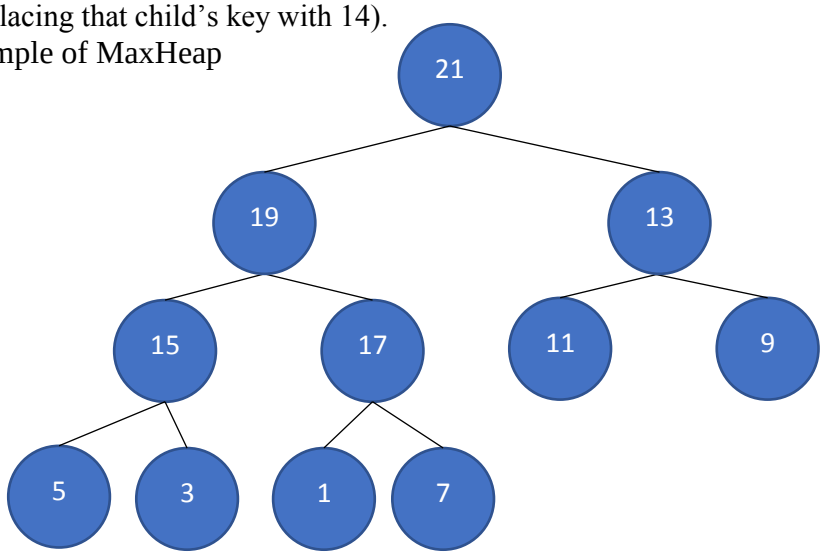
Step3: merge subtree and downheap incase of heaporder violation



Problem3

3. Draw an example of a MaxHeap whose keys are all the odd numbers lie in [1, 21] (with no repeats), such that the insertion of an item with key 14 would cause up-heap to proceed all the way up to a child of the root (replacing that child's key with 14).

Solution: Example of MaxHeap



Now, insert 14